

Math Achievement Rubric for Knollwood Report Card Grade 4

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Performance Indicators	Rubric
Understands the meanings, uses and representations of numbers	<p>3</p> <ul style="list-style-type: none"> • Reads and writes whole numbers up to 1,000,000,000 and decimals through thousandths • Identifies places in such numbers and values of the digits in those places • Translates between whole numbers and decimals represented in words and in base-10 notation • Reads, writes and models fractions • Solves problems involving fractional parts of a region or a collection • Describes and explains strategies used • Given a fraction part of a region or a collection, identifies the unit whole • Finds multiples of whole numbers less than 10 • Finds whole-number factors
	<p>2</p> <ul style="list-style-type: none"> • Reads and writes whole numbers up to 1,000,000 • Reads, writes, and models with manipulatives decimals through hundredths • Identifies places in such numbers and the values of the digits in those places • Translates between whole numbers and decimals represented in words, in base-10 notation, and with manipulatives • Reads, writes, and models fractions • Solves problems involving fractional parts of a region or a collection • Describes strategies used
	<p>1</p> <ul style="list-style-type: none"> • Counts on by 1s, 2s, 5s, 10s, 25s, and 100s past 1,000 and back by 1s from any number less than 1,000 with and without number grids, number lines, and calculators • Reads, writes, and models with manipulatives whole numbers up to 10,000

	<ul style="list-style-type: none"> • Identifies places in such numbers and the values of the digits in those places • Reads and writes money amounts in dollars-and-cents notation • Uses manipulatives and drawings to model fractions as equal parts of a region or a collection • Describes the models and names the fractions • Recognizes numbers as odd or even
	<p style="text-align: center;">E</p> <ul style="list-style-type: none"> • Reads whole numbers and decimals • Writes whole numbers and decimals • Identifies places in whole numbers and decimals and the value of the digits in those places • Uses expanded notation to represent whole numbers and decimals • Solves problems involving percents and discounts and explains strategies • Identifies the unit whole in situations involving fractions • Identifies prime and composite numbers • Factors numbers • Finds prime factorizations
Understands equivalent names for numbers	<p style="text-align: center;">3</p> <ul style="list-style-type: none"> • Uses numerical expressions involving one or more of the basic four arithmetic operations and group symbols to give equivalent names for whole numbers, fractions and decimals • Uses and explains a multiplication rule to find equivalent fractions • Renames fourths, fifths tenths, and hundredths as decimals and percents
	<p style="text-align: center;">2</p> <ul style="list-style-type: none"> • Uses numerical expressions involving one or more of the basic four arithmetic operations to give equivalent names for whole numbers • Uses manipulatives and drawings to find and represent equivalent names for fractions • Uses manipulatives to generate equivalent fractions
	<p style="text-align: center;">1</p>

	<ul style="list-style-type: none"> • Uses tally marks, arrays, and numerical expressions involving addition and subtraction to give equivalent names for whole numbers • Uses manipulatives and drawings to model equivalent names for $\frac{1}{2}$
	<p style="text-align: center;">E</p> <ul style="list-style-type: none"> • Uses numerical expressions involving one or more of the basic four arithmetic operations, grouping symbols, and exponents to give equivalent names for whole numbers • Converts between base-10, exponential, and repeated-factor notations • Uses numerical expressions to find and represent equivalent names for fractions, decimals, and percents • Uses and explains multiplication and division rules to find equivalent fractions and fractions in simplest form • Converts between fractions, mixed numbers, decimals, and percents
Understands common numerical relations	<p style="text-align: center;">3</p> <ul style="list-style-type: none"> • Compares and orders whole numbers up to 1,000,000,000 and decimals through thousandths • Compares and orders integers • Uses area models, benchmark fractions and analyses of numerators and denominators to compare and order fractions
	<p style="text-align: center;">2</p> <ul style="list-style-type: none"> • Compares and orders whole numbers up to 1,000,000 • Uses manipulatives to order decimals through hundredths • Uses area models and benchmark fractions to compare and order fractions
	<p style="text-align: center;">1</p> <ul style="list-style-type: none"> • Compares and orders whole numbers up to 10,000 • Uses area models to compare fractions
	<p style="text-align: center;">E</p> <ul style="list-style-type: none"> • Compares and orders rational numbers • Uses area models, benchmark fractions and analyses of numerators and denominators to compare and order fractions and mixed numbers

	<ul style="list-style-type: none"> Describes strategies used to compare fractions and mixed numbers
Understands the systems and processes of measurement: uses appropriate techniques, tools, units, and formulas in making measurements	<p>3</p> <ul style="list-style-type: none"> Estimates length with and without tools Measures length with tools to the nearest $\frac{1}{4}$ inch and $\frac{1}{2}$ centimeter Estimates the size of angles without tools Describes and uses strategies to measure the perimeter and area of polygons, to estimate the area of irregular shapes, and to find the volume of rectangular prisms Describes the relationships among U.S. customary units of length and among metric units of length
	<p>2</p> <ul style="list-style-type: none"> Estimates length with tools Measures length to the nearest $\frac{1}{2}$ inch and $\frac{1}{2}$ centimeter Draws and describes angles as records of rotations Describes and uses strategies to measure the perimeter of polygons Counts unit squares to find the areas of rectangles Describes relationships among inches, feet, and yards Describes relationships between minutes in an hour, hours in a day, days in a week
	<p>1</p> <ul style="list-style-type: none"> Estimates length with tools Measures length to the nearest inch and centimeter Uses standard and nonstandard tools to measure and estimate weight Counts unit squares to find the areas of rectangles Describes relationships between days in a week and hours in a day
	<p>E</p> <ul style="list-style-type: none"> Estimates length with and without tools Measures length with tools to the nearest $\frac{1}{8}$ inch and millimeter Estimates the measure of angles with and without tools Uses tools to draw angle with given measures Describes and uses strategies to find the perimeter of polygons and the area of circles

	<ul style="list-style-type: none"> • Chooses and uses appropriate formulas to calculate the areas of rectangles, parallelograms, and triangles, and the volume of a prism • Defines pi as the ratio of a circle's circumference to its diameter • Describes relationships among U.S. customary units of length, among metric units of length, and among U.S. customary units of capacity
Uses and understands reference frames	<p>3</p> <ul style="list-style-type: none"> • Uses ordered pairs of numbers to name, locate, and plot points in the first quadrant of a coordinate grid
	<p>2</p> <ul style="list-style-type: none"> • Uses ordered pairs of numbers to name and locate points in the first quadrant of a coordinate grid
	<p>1</p> <ul style="list-style-type: none"> • Uses ordered pairs of numbers to name points in the first quadrant of a coordinate grid
	<p>E</p> <ul style="list-style-type: none"> • Uses ordered pairs of numbers to name, locate, and plot points in all four quadrants of a coordinate grid
Computes accurately	<p>3</p> <ul style="list-style-type: none"> • Uses manipulatives, mental arithmetic, paper-and-pencil algorithms, and calculators to solve the following types of problems: <ul style="list-style-type: none"> ❖ Addition and subtraction of whole numbers and decimals through hundredths ❖ Multiplication of multidigit whole numbers by 2-digit whole numbers and the division of multidigit whole numbers by 1-digit whole numbers ❖ Addition and subtraction of fractions with like and unlike denominators • Tells the strategies used
	<p>2</p> <ul style="list-style-type: none"> • Uses basic facts to compute fact extensions such as $80 + 70$ • Uses manipulatives, mental arithmetic, paper-and-pencil algorithms, and calculators to solve problems involving the addition and subtraction of whole numbers and decimals in a money context

	<ul style="list-style-type: none"> • Demonstrates automaticity with $\times 0$, $\times 1$, $\times 2$, $\times 5$, and $\times 10$ multiplication facts • Uses strategies to compute remaining facts up to 10×10 • Uses arrays, mental arithmetic, paper-and-pencil algorithms, and calculators to solve problems involving the multiplication of 2- and 3-digit whole numbers by 1-digit whole numbers
	<p style="text-align: center;">1</p> <ul style="list-style-type: none"> • Demonstrates automaticity with $+/- 0$, $+/- 1$, doubles, and sum-equals-ten facts, and proficiency with all addition and subtraction facts through $10 + 10$ • Uses manipulatives, number grids, tally marks, mental arithmetic, paper & pencil, and calculators to solve problems involving the addition and subtraction of 2-digit whole numbers
	<p style="text-align: center;">E</p> <ul style="list-style-type: none"> • Uses mental arithmetic, paper-and-pencil algorithms, diagrams, area models, and calculators to solve the following types of problems: <ul style="list-style-type: none"> ❖ Addition and subtraction with whole numbers, decimals, and signed numbers ❖ Multiplication of whole numbers and decimals and the division of multidigit whole numbers and decimals by whole numbers ❖ Addition and subtraction of fractions and mixed numbers ❖ Multiplication of fractions and mixed numbers ❖ Division of fractions • Expresses remainders as whole numbers or fractions as appropriate • Describes the strategies used and explains how they work
Makes reasonable estimates	<p style="text-align: center;">3</p> <ul style="list-style-type: none"> • Makes reasonable estimates for whole number and decimal addition and subtraction problems and whole number multiplication and division problems • Explains how the estimates were obtained
	<p style="text-align: center;">2</p> <ul style="list-style-type: none"> • Makes reasonable estimates for whole number addition and subtraction problems • Indicates how the estimates were obtained

	<p>1</p> <ul style="list-style-type: none"> • Makes reasonable estimates for whole number addition and subtraction problems • Explains how the estimates were obtained
	<p>E</p> <ul style="list-style-type: none"> • Can make reasonable estimates for whole number, decimal, fraction and mixed number problems • Tells how the estimates were obtained
Understands meanings of operations	<p>3</p> <ul style="list-style-type: none"> • Uses repeated addition, skip counting, arrays, and area to model multiplication and division • Uses counters and number lines to model addition and subtraction of integers
	<p>2</p> <ul style="list-style-type: none"> • Uses repeated addition, arrays, and skip counting to model multiplication • Uses equal sharing and equal grouping to model division • Uses counters and number lines to model addition of integers
	<p>1</p> <ul style="list-style-type: none"> • Identifies and describes change, comparison, and parts-and-total situations • Uses repeated addition, arrays, and skip counting to model multiplication • Uses equal sharing and equal grouping to model division • Uses counters and number lines to model addition and subtraction of whole numbers
	<p>E</p> <ul style="list-style-type: none"> • Uses repeated addition, arrays, and area to model multiplication and division • Uses ratios expressed as words, fractions, percents, and with colons • Uses counters and number lines to model and explain addition and subtraction of integers
Knows basic facts (per grade-level expectations)	<p>3</p> <ul style="list-style-type: none"> • When presented with a math fact, can give answer orally or in written form immediately and correctly, without hesitation • Mental math reflects secure knowledge of math facts • Written work shows evidence of secure knowledge of math facts

	<p>2</p> <ul style="list-style-type: none"> When presented with a math fact, can give answer orally or in written form within a few seconds, and, generally, it is correct Mental math reflects developing knowledge of math facts Written work shows evidence of developing knowledge of math facts
	<p>1</p> <ul style="list-style-type: none"> When presented with a math fact, can give answer orally or in written form with some hesitation, and it is sometimes correct Mental math reflects some knowledge of math facts Written work shows evidence of some knowledge of math facts
	<p>E</p> <ul style="list-style-type: none"> When presented with a math fact, can give answer orally or in written form immediately and correctly, without hesitation Mental math reflects secure knowledge of math facts Written work shows evidence of secure knowledge of math facts Math facts memorized beyond grade-level benchmarks
Investigates characteristics and properties of 2- and 3-dimensional geometric shapes	<p>3</p> <ul style="list-style-type: none"> I identifies, draws, and describes points, intersecting and parallel line segments and lines, rays, and right, acute, and obtuse angles Describes, compares, and classifies plane and solid figures, including polygons, circles, spheres, cylinders, rectangular prisms, cones, cubes, and pyramids, using appropriate geometric terms including vertex, base, face, edge, and congruent figures
	<p>2</p> <ul style="list-style-type: none"> I identifies and draw points, intersecting and parallel line segments and lines, rays, and right angles I identifies, describes, models, and compares plane and solid figures including circles, polygons, spheres, cylinders, rectangular prisms, pyramids, cones, and cubes using appropriate geometric terms including the terms face, edge, vertex, and base
	<p>1</p> <ul style="list-style-type: none"> Draws line segments and identifies parallel line segments

	<ul style="list-style-type: none"> Identifies, describes, and models plane and solid figures including circles, triangles, squares, rectangles, cones, and cubes
	<p>E</p> <ul style="list-style-type: none"> Identifies, describes, compares, names, and draws right, acute, obtuse, straight, and reflex angles Determines angle measures in vertical and supplementary angles and by applying properties of sums of angle measures in triangles and quadrangles
Applies transformations and symmetry in geometric situations	<p>3</p> <ul style="list-style-type: none"> Identifies, describes, and sketches examples of reflections Identifies and describes examples of translations and rotations Creates and completes 2-dimensional symmetric shapes or designs
	<p>2</p> <ul style="list-style-type: none"> Creates and completes 2-dimensional symmetric shapes or designs Locates multiple lines of symmetry in a 2-dimensional shape
	<p>1</p> <ul style="list-style-type: none"> Creates and completes 2-dimensional symmetric shapes or designs
	<p>E</p> <ul style="list-style-type: none"> Identifies, describes, and sketches examples of reflections, translations, and rotations
Selects and creates appropriate graphical representations of collected or given data	<p>3</p> <ul style="list-style-type: none"> Collects and organizes data or uses given data to create charts, tables, bar graphs, line plots, and line graphs
	<p>2</p> <ul style="list-style-type: none"> Collects and organizes data or uses given data to create charts, tables, bar graphs, and line plots
	<p>1</p> <ul style="list-style-type: none"> Collects and organizes data or uses given data to create tally charts, tables, and bar graphs

	<p>E</p> <ul style="list-style-type: none"> Collects and organizes data or uses given data to create bar, line, and circle graphs with reasonable titles, labels, keys, and intervals
Analyzes and interprets data	<p>3</p> <ul style="list-style-type: none"> Uses the maximum, minimum, range, median, mode, and graphs to ask and answer questions, draw conclusions, and make predictions
	<p>2</p> <ul style="list-style-type: none"> Uses graphs to ask and answer simple questions and draw conclusions Finds the maximum and minimum of a data set
	<p>1</p> <ul style="list-style-type: none"> Uses graphs to ask and answer simple questions and draws conclusions Finds the maximum, minimum, mode, and median of a data set
	<p>E</p> <ul style="list-style-type: none"> Uses the maximum, minimum, range, median, mode, and mean and graphs to ask and answer questions, draw conclusions, and make predictions
Understands and applies basic concepts of probability	<p>3</p> <ul style="list-style-type: none"> Describes events using certain, very likely, likely, unlikely, very unlikely, impossible and other basic probability terms Uses more likely, equally likely, same chance, 50-50, less likely, and other basic probability terms to compare events Explain the choice of language Predicts the outcomes of experiments and tests the predictions using manipulatives Summarizes the results and uses them to predict future events Expresses the probability of an event as a fraction
	<p>2</p> <ul style="list-style-type: none"> Describes events using certain, very likely, likely, unlikely, very unlikely, impossible, and other basic probability terms Predicts the outcomes of simple experiments and tests the predictions using manipulatives Expresses the probability of an event by using “___ out of ___”

	<p>1</p> <ul style="list-style-type: none"> Describes events using certain, likely, unlikely, impossible and other basic probability terms
	<p>E</p> <ul style="list-style-type: none"> Describes events using certain, very likely, likely, unlikely, very unlikely, impossible and other basic probability terms Uses more likely, equally likely, same chance, 50-50, less likely, and other basic probability terms to compare events Explain the choice of language Predicts the outcomes of experiments, tests the predictions using manipulatives, and summarizes the results Compares predictions based on theoretical probability with experimental results Uses summaries and comparisons to predict future events Expresses the probability of an event as a fraction, decimal, or percent
Understands patterns and functions	<p>3</p> <ul style="list-style-type: none"> Extends and describes numeric patterns Describes rules for patterns and uses them to solve problems Uses words and symbols to describe and write rules for functions that involve the four basic arithmetic operations and use those rules to solve problems
	<p>2</p> <ul style="list-style-type: none"> Extends, describes, and creates numeric patterns Describes rules for simple patterns and uses them to solve problems Uses words and symbols to describe and write rules for functions involving addition, subtraction, and multiplication and uses those rules to solve problems
	<p>1</p> <ul style="list-style-type: none"> Extends visual and concrete patterns Describes rules for simple patterns and uses them to solve problems Uses words and symbols to describes and writes rules for functions involving addition and subtraction and uses those rules to solve problems

	<p>E</p> <ul style="list-style-type: none"> • Extends, describes, and creates numeric patterns • Describes rules for patterns and uses them to solve problems • Writes rules for functions involving the four basic arithmetic operations • Represents functions using words, symbols, tables, and graphs and uses those representations to solve problems
Uses algebraic notation to represent and analyze situations and structures	<p>3</p> <ul style="list-style-type: none"> • Uses conventional notation to write expressions and number sentences using the four basic arithmetic operations • Determines whether number sentences are true or false • Solves open sentences and explains the solutions • Writes expressions and number sentences to model number stories • Evaluates numeric expressions containing grouping symbols • Inserts grouping symbols to make number sentences true • Applies the Distributive Property of Multiplication over Addition to the partial-products multiplication algorithm
	<p>2</p> <ul style="list-style-type: none"> • Reads, writes, and explains number sentences using the symbols $+$, $-$, \times, $/$, $=$, $>$, $<$ • Solves number sentences • Writes expressions and number sentences to model number stories • Recognizes that numeric expressions can have different values depending on the order in which operations are carried out • Understands that grouping symbols can be used to affect the order in which operations are carried out • Uses the underlying principles of the Commutative and Associative Properties of Addition, the Commutative Property of Multiplication, and the Multiplicative Identity
	<p>1</p> <ul style="list-style-type: none"> • Reads, writes, and explains expressions and number sentences using the symbols $+$, $-$, $=$, $>$, and $<$

	<ul style="list-style-type: none"> • Solves number sentences involving addition and subtraction • Writes expressions and number sentences to model number stories • Applies the Commutative and Associative Properties of Addition to mental arithmetic problems
	<p style="text-align: center;">E</p> <ul style="list-style-type: none"> • Determines whether number sentences are true or false • Solves open number sentences and explains the solutions • Uses a letter variable to write an open sentence to model a number story • Evaluates numeric expressions containing grouping symbols and nested grouping symbols • Inserts grouping symbols and nested grouping symbols to make number sentences true • Describes and uses the precedence of multiplication and division over addition and subtraction • Describes and applies the properties of arithmetic
Applies concepts and skills previously learned to solve multi-step problems	<p style="text-align: center;">3</p> <ul style="list-style-type: none"> • Analyzes problems, identifies components, and then formulates plan for solving • Extends, modifies, or reformulates methods as solution unfolds • Can support numeric solutions with graphical representations • Uses prescribed graphical representations and/or physical objects to solve problems or illustrate solutions • Explains solutions to problems using sentences/paragraphs in speaking or writing • Makes overt connections with graphical or pictorial representations • Uses mathematical terminology appropriate to the situation
	<p style="text-align: center;">2</p> <ul style="list-style-type: none"> • Uses prescribed processes to solve problems • Can use alternate processes to solve problems following demonstration of such • Graphical representations accompany solutions when required • Can use alternate processes to solve problems following demonstrations of such • Describes process of solving problems with simple sentences or bulleted phrases

	<ul style="list-style-type: none"> • Sketches of physical objects, simple graphic organizers, or graphs to represent the situation sometimes accompany written responses • Mathematical terminology included in the problem can be included in explanation of solution
	<p>1</p> <ul style="list-style-type: none"> • Uses parts of given processes to begin to solve problems • Graphical representations serve as add-on to solutions • Uses parts of given processes to begin to solve problems • Names parts of solution • Tells about problem using some mathematical terms given in problem • Sketches or graphs are sometimes presented with solution but are not always clearly linked
	<p>E</p> <ul style="list-style-type: none"> • Designs methods of solving problems based on analysis and application of given theories and knowledge in new situations • Provides counter examples in order to prove solutions • Chooses to use graphical representations and/or physical objects in unorthodox ways to solve problems or illustrate solutions • Provides counter examples in order to prove solutions • Designs methods of solving problems based on analysis and application of given theories and knowledge in new situations • Convinces others that solutions to problems are plausible and supports his/her thinking by using sentences/paragraphs in speaking or writing and makes clear and overt connections with graphical or pictorial representations • Communications always contain appropriate and sophisticated mathematical language and notations